

## **APPENDIX D**

# MCCWA Weed Management Plan

Draft Invasive Non-Native Plant (Weed) Management Plan  
for the Mouth of Cottonwood Creek Wildlife Area





**INVASIVE NON-NATIVE PLANT  
(WEED) MANAGEMENT PLAN  
FOR THE  
MOUTH OF COTTONWOOD CREEK  
WILDLIFE AREA**

**PREPARED FOR:  
California Department of Fish and Game  
North Cost Region**

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## 1.0 INTRODUCTION

The Mouth of Cottonwood Creek Wildlife Area (MCCWA) is located mostly in south-central Shasta County, west of the Sacramento River, northeast of the town of Cottonwood, and mostly north of Cottonwood Creek. The MCCWA consists of three units: the Cottonwood Creek Unit (CCU), the Balls Ferry Wetland Unit 1 (BFW1) and the Balls Ferry Wetland Unit 2 (BFW2), all of which are located on the Balls Ferry USGS 7.5' quadrangle. The California Department of Fish and Game (CDFG) acquired MCCWA lands to protect, restore, and enhance riparian and wetland habitats.

The CCU (approximately 571 acres) extends north and west from the confluence of Cottonwood Creek and the Sacramento River, along the north side of Cottonwood Creek in Shasta County. The CCU is located between Adobe Road and Cottonwood Creek. The exact southern boundary of this unit is unclear. (The Shasta County Assessor parcel records show the property extending south of Cottonwood Creek; however, the Shasta – Tehama County boundary indicates all of the parcels but one are in Shasta County, north of Cottonwood Creek.) Access to the site is via two gated and locked north-south trending gravel roads extending south from Adobe Road - an eastern and a western entrance. There is a small public parking lot at the eastern entrance, opposite the junction of Adobe and Hacienda Rd., along with a pedestrian access trail.

BFW1 and BFW2 are located approximately  $\frac{3}{4}$  mile to the north, entirely within Shasta County. BFW1 totals 348 acres; Venzke Road borders it on the south and Balls Ferry Road on the north. Access is via a south entrance from Venzke Road or a north entrance from Balls Ferry Road; both points are behind locked gates. This unit is not open to the public without permission from CDFG.

BFW2 consists of three parcels totaling approximately 141 acres. It is located on either side of Balls Ferry Road. South of Balls Ferry Road, it shares the eastern boundary with BFW1. North of Balls Ferry Road, the access is primarily from Webb Road through locked gates. The parcel that lies south of Balls Ferry Road is accessed via a gated dirt road entrance. There are no roads or trails, and the BFW2 is closed to the public due to ongoing management activities (J. Chakarun, personal communication). Figure 1 depicts the general location of the MCCWA.



## 1.1 Rationale for Managing Non-Native Invasive Plants

It is widely recognized that non-native invasive plants (weeds) compete with and displace native plants and animals, and other organisms that depend on these native plants. They can alter ecosystem functions and cycles, hybridize with native species, and promote other non-native or undesirable species.

Most natural resource management goals include stopping, slowing or reversing non-native plant invasions to promote native populations and habitats. In certain situations, management goals include restoration of badly infested areas to healthy systems dominated by native species. In most cases, achieving these goals require active management to control and manage the invasive plants.

## 1.2 Overview of this Plan

This plan provides a preliminary strategy for managing the highest priority invasive non-native plants at MCCWA. It includes information on non-native plants identified to date on wildlife area lands, the relative threats posed by those species, and considerations for prioritizing species for management. The plan also includes an initial list of the highest priority species. This is a preliminary list; additional information will be required before CDFG manager's can develop a final priority list. This required information includes, but is not limited to, the following:

- detailed maps of individual occurrences of the species;
- density of the plants within those occurrences;
- potential for the species to spread;
- the proximity of the occurrences to water; and
- proximity of the occurrences to special-status plant or wildlife populations or habitat.

The plan also presents information on approaches, tools, and techniques available for controlling weeds in natural areas, site rehabilitation and restoration, and follow-up monitoring. The strategy presented in this plan is an adaptive strategy. It will require refinement when additional information about the target species, and about the effectiveness of various treatments, becomes available. Designed to be a stand-alone plan, this document repeats some information contained in the Draft MCCWA LMP. CDFG input will be required to finalize this document for use in the field.

## 2.0 INVENTORY AND ASSESSMENT OF INVASIVE NON-NATIVE PLANTS

Baseline reconnaissance level botanical surveys were conducted in late May and early June of 2006 on the CCU and BFW1 (R. Buck, 2006, unpublished report prepared for Sustain Environmental Inc.). Botanists conducted surveys to fulfill the following objectives:

- 1) To map and characterize plant communities;
- 2) To develop a preliminary floristic species list; and
- 3) To locate and map occurrences of special-status plant species and sensitive habitats.



The Draft LMP for the Mouth of Cottonwood Creek Wildlife Area details the methods and results of this survey effort (See Section III, Habitat and Species). The results of the botanical survey are preliminary. Access problems, including inundation, impenetrable emergent marsh vegetation, impenetrable riparian forest understory, and lack of access across Cottonwood Creek precluded a complete survey of the property. BFW2 (acquired in 2008), was not included in the survey effort, and only gross level plant communities have been mapped. There have been no floristic surveys of BFW2 at the time of the preparation of this document. Floristic surveys of BFW2 are considered a “Step Down” action of the LMP.

## 2.1 Summary of Vegetation in the Wildlife Area

Based upon the preliminary botanical resource assessment, the CCU supports 166 vascular plant taxa (species, subspecies, and varieties). Of these, 74 are native and 88 are non-native. It is not known whether four taxa recorded are native or non-native: cleavers (*Galium aparine*) and Kentucky bluegrass (*Poa pratensis*) (because standard references disagree on whether or not these taxa are native to California); and horseweed (*Conyza* sp.) and tobacco (*Nicotiana* sp.). (These later two taxa could only be identified to genus, and both native and non-native species could occur in the area).

On BFW1, botanists identified 155 vascular plant taxa (species, subspecies, and varieties). Of these, 65 are native and 89 are non-native. Kentucky bluegrass also occurs on this unit, and as stated previously, there is some scientific debate whether it is native or non-native in California. A number of observed species could not be identified because surveys were conducted before their flowering period, and plant parts necessary for identification (flowers and/or fruits) were not present. A lesser number of observed species, mostly annuals, were already were past the stage when identification would have been possible.

The MCCWA has eight primary plant communities (ruderal is divided into two subtypes: developed and Himalayan blackberry). Details on the geographic distribution within each unit and the plant species composition of these habitats are in the Draft LMP (See Section III, Habitat and Species). Table I presents the primary habitat types recorded on the properties that make up the MCCWA.

**Table 1. Primary Habitat Types at MCCWA.**

Habitat Types	CCU	BFW1	BFW2
California annual grassland	X	X	X
Valley oak savanna	X	X	
Great Valley mixed riparian forest	X	X	X
Floodplain	X		
Freshwater emergent wetland and pond	X	X	X
Vernal pond/swale/seasonal ponds		X	
Seep		X	
Ruderal: Himalayan blackberry	X	X	X
Ruderal: Developed		X	X

CCU: Cottonwood Creek Unit; BFW1: Balls Ferry Wetland Unit 1; BFW2: Balls Ferry Wetland Unit 2

## 2.2 Special-status Plants

When managing non-native plant species, it is critical to avoid direct or indirect harm to special-status species, hence the need for precise location mapping. In freshwater marsh and pond-freshwater marsh habitat types, botanists documented the special-status species fox sedge (*Carex vulpinoidea*), which was widely scattered, but usually localized, in, or near the margins of, freshwater marsh habitats. In 1994, Hubbell and Marr documented the special-status species silky cryptantha (*Cryptantha crinita*) at two locations along the Cottonwood Creek floodplain (Hubbell and Marr 1994). It was not located in 2006 (Buck, unpublished report). In addition to conducting focused surveys for special-status plants at BFW2, additional surveys and mapping are recommended (See Section IV, Biological Elements).

## 2.3 Non-native Plant Species

A list of all non-native plant taxa identified to date in the MCCWA is included as Appendix D-1 (see appendices in *this* document). The draft LMP describes the general distributions of these taxa within the various habitat types of the wildlife area (See LMP Section III, Habitat and Species).

Himalayan blackberry (*Rubus discolor*) was the most widespread invasive species on the property, forming extensive patches in or at the margins of several habitat types including California annual grassland, grassland-savanna, Great Valley mixed riparian forest, and freshwater marsh. Some areas dominated by Himalayan blackberry were large enough to map as a distinct habitat type: Himalayan blackberry/ruderal. Especially noteworthy is the widespread degradation of riparian forest understory, especially on the CCU, by extensive infestations of Himalayan blackberry.

Other invasive species with extensive or widespread infestations in dry to moist habitats on one or both units include yellow star-thistle (*Centaurea solstitialis*), medusahead (*Taeniatherum caput-medusae*), velvet grass (*Holcus lanatus*), tall fescue *Festuca arundinacea*), pennyroyal (*Mentha pulegium*), and cultivated grape (*Vitis vinifera*). Floating primrose-willow (creeping water-primrose; possibly Uruguay water-primrose; *Ludwigia peploides* or *L. hexapetala*) is an invasive species that has extensive infestations in ponds and freshwater marshes on both the Balls Ferry Units.

Other invasive species currently of relatively limited occurrence, but that could potentially become more widespread, include, in dry to moist habitats, broadleaved pepperweed (or perennial pepperweed; *Lepidium latifolium*), giant reed (*Arundo donax*), tree-of-heaven (*Ailanthus altissima*), edible fig (*Ficus carica*), and white poplar (*Populus alba*); and, in freshwater marshes, parrot's feather (*Myriophyllum aquaticum*) and pale yellow iris (*Iris psuedacorus*).

Grasslands and savannas supported the greatest concentrations of non-native species. Common taxa included yellow starthistle, medusahead, mustards (*Brassica* spp.), filarees (*Erodium* spp.), ripgut brome (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), wild

oats (*Avena* spp.), ryegrasses (*Lolium* spp.), Mediterranean barleys (*Hordeum* spp.), non-native fescues (*Festuca* spp.), and bur-clover (*Medicago polymorpha*). A few of these species are particularly problematic. Yellow starthistle is of special concern because it degrades forage species, depletes soil moisture and adversely affects the habitat quality of grasslands and savannas (Bossard et al. 2000).

### 3.0 MANAGEMENT APPROACH AND CONSIDERATIONS

It is best to develop a management strategy for non-native invasive plants that is adaptive, and modified over time based on monitoring the effectiveness of treatment, and new information on species presence or the threats they pose, etc. The following list presents a sequence of steps that aid in developing and implementing an adaptive weed management plan:

- a) Establish management goals and objectives for the site.
- b) Determine which plant species or populations block, or have potential to block attainment of the management goals and objectives.
- c) Identify, document, and map those species or populations, and then assign a priority to these species or to individual occurrences, based on level of threat, feasibility of control, etc.
- d) Consider all methods available to eradicate or control targets, or other ways to reduce their adverse impacts; if necessary, re-order priorities.
- e) Develop and implement a management plan designed to move conditions toward management goals and objectives.
- f) Monitor and assess the effectiveness of management actions in terms of moving conditions toward goals and objectives; and
- g) Re-evaluate, modify, and start the cycle again.

Note that control activities do not begin until completion of the first four steps. The initial goals, objectives and plans must be periodically reevaluated so they can be altered or modified as needed. In the end, this will save time and money, and will reduce the chance of making mistakes.

Non-native plant management is a component of an overall comprehensive site management and restoration program for the MCCWA. The focus of management is on the desired native species and communities on site, rather than on simply eliminating the undesirable species. In some cases, removing the targeted non-native species will result in colonization by desirable natives, but in many cases, such colonization does not occur without additional restoration work such as soil treatment, seeding, transplanting, etc.

It is also very important to implement a prevention program to keep the site free of non-native species that are not yet present, but which are known to be invasive elsewhere in the region. Managers must be particularly aware of species that are not yet on their site, but which occur nearby. The ultimate goal should be to preserve native species, communities and functioning ecosystems.

### 3.1 Data and Maps of Target Species Occurrences

Maps of the extent of species occurrences and estimates of density or cover are essential for a successful program. Maps and data on existing conditions provide a baseline (standard) for measuring success of control or removal efforts. Such information also facilitates cooperative efforts with adjacent land owners/managers. If, and when, herbicides are used, maps and density data will facilitate reporting purposes. While the initial cost of mapping can be high, working cooperatively with the regional Weed Management Area (WMA) group may help minimize the expense to CDFG. Integrating the data acquisition needs with the educational objectives of the Balls Ferry Research and Education Center can realize additional cost savings. Mapping is required for the California Environmental Quality Act (CEQA) compliance process.

Mapping and documenting species that are anticipated to be the targeted highest priority species should be conducted first. Section 3.3 presents a preliminary list of such species.

### 3.2 Prioritizing Species for Management

It is critical to set priorities for non-native invasive plant management actions. Managers must identify the highest priority species occurring on their land, and in many cases, the highest priority occurrences within species. For example, Himalayan blackberry poses a much greater threat if it is growing in an area supporting a high percentage of native species or rare species. At the MCCWA, Himalayan blackberry provides nesting habitat for the yellow-breasted chat, a California Species of Special Concern (Santry, personal communication; Burnett and DeStaebler 2003). Managers will need to evaluate those instances where control methods could result in more damage to native species and habitats than by maintaining the status quo. Setting priorities will help to ensure the most efficient and effective use of the resources available for non-native plant management.

There are a number of systems in use for prioritizing removal and management efforts. The first step is to determine the level of threat posed by the invasive non-native species identified. This information can be obtained from lists maintained by the [U.S. Department of Agriculture](#), the [California Department of Food and Agriculture](#) (CDFA), the [California Invasive Plant Council \(Cal-IPC\)](#), and others. The CDFA list initially was prioritized based on threats to agricultural crop lands, but the list now incorporates threats to native habitats in California. The list uses an A-D rating system: A is the highest priority for eradication and D is of lower priority. Cal-IPC provides a list of invasive plant species occurring in California, as well as assessments of potential invasiveness and other basic information. Bossard et al. (2000) provide additional, detailed information about invasive plants in California. See Appendix D-2 (this document) for a list of additional resources on non-native plant management and prioritization.

After assessing the existing information on the species, managers need to evaluate several other site-specific elements before establishing their priorities for treatment. Elements to consider include the following:

- **Extent of Infestations.** Small, incipient occurrences (new populations or outliers of larger infestations) of species posing a high level of threat would usually be high

priority. Species present in large infestations that continue to expand would be a medium priority, and species present in large infestations that are not expanding would generally be lower.

- **Current and Potential Impacts of the Infestations.** For example, if the infestation were immediately threatening rare plants or their habitat, it would likely be high priority.
- **Ecological Value of Habitats or Areas that are Infested or May Become Infested.** The highest priority should be given to infestations that occur in the most highly valued habitats or areas, such as wetlands, areas with rare or highly valued species or communities, and areas that provide vital resources. Infestations in less highly valued portions of the site would be intermediate priorities; and areas already badly infested with other invasive non-natives may be a lower priority, unless the species in question will make the situation significantly worse. Also consider threats to ecosystem parameters such as soil integrity, which can be changed by certain non-native species.
- **Feasibility of Success.** Realistically factoring the cost and difficulty of the control measures must be included in the prioritization of target species. Highest priority would be given, in most cases, to species or occurrences likely to be controlled or eliminated with available technology and resources, and sites that will be re-colonized by desirable native species with little further input. Lower priority would be given to species or occurrences that are likely to be controlled, but where they will not be replaced by desirable natives without an active restoration program. Species that are difficult to control and/or whose control would likely result in substantial damage to desirable species would be low.

### 3.3 Preliminary Prioritization of Species for Control on MCCWA.

The following section is preliminary; it is only the first effort based upon the baseline inventory. Development of a fully prioritized plan is beyond the scope of this effort because additional data collection, mapping, and internal decision-making must occur. The priority list presented is based on Cal-IPC's Invasive Plant Inventory, which categorizes non-native invasive plants that threaten the state's wildlands. Categorization is based on an assessment of the ecological impacts of each plant. The Inventory represents the best available knowledge of invasive plant experts in the state. The following paragraph is from [Cal-IPC's website](#):

The Inventory categorizes plants as High, Moderate, or Limited, reflecting the level of each species' negative ecological impact in California. Other factors, such as economic impact or difficulty of management, are not included in the assessment. It is important to note that even Limited species are invasive and should be of concern to land managers. Although the impact of each plant varies regionally, its rating represents cumulative impacts statewide. Therefore, a plant whose statewide impacts are categorized as Limited may have more severe impacts in a particular region. Conversely, a plant categorized as having a High cumulative impact across California may have very little impact in some regions.

Appendix D-3 (this document) provides a list of non-native invasive plants known to occur at MCCWA that are rated as Moderate or High by Cal-IPC.

Table 2 is a preliminary list of the invasive species present or that have the immediate potential to invade the MCCWA that are likely to be the highest priorities for management. The assessment that preceded development of this table included information from Cal-IPC and our best professional judgment.

**Table 2. Preliminary list of high priority invasive species present or that have the immediate potential to invade the MCCWA.**

Common Name	Priority	CCU	BFW1
Tree-of-heaven ( <i>Ailanthus altissima</i> )	high	x	x
Giant reed ( <i>Arundo donax</i> )	very high	x	x
Yellow star-thistle ( <i>Centaurea solstitialis</i> )	very high	x	x
Himalayan blackberry ( <i>Rubus discolor</i> or <i>R. armeniacus</i> )	high to very high	x	x
Parrotfeather ( <i>Myriophyllum aquaticum</i> )	very high	x	x
Perennial pepperweed ( <i>Lepidium latifolium</i> )	very high	x	
Water primrose ( <i>Ludwigia hexapetala</i> or <i>L. peploides</i> ) <sup>1</sup>	very high		x

BFW1= Balls Ferry Wetland Unit 1, CCU= Cottonwood Creek Unit

<sup>1</sup> Around the margins of most of the ponds, and locally in freshwater marsh areas with deeper water, there are dense colonies of a species tentatively identified as the non-native, invasive, pubescent form of floating primrose-willow (creeping water-primrose; *Ludwigia peploides* ssp. *montevidensis*), often intermixed with the native form. This plant sometimes grows more or less erect (in contrast to the native form, which is always more or less prostrate and floating or creeping on drying mud) and has larger flowers than the native form. It could, therefore, be Uruguay water-primrose (*Ludwigia hexapetala*), a species previously known in California only from coastal counties. Uruguay water-primrose is also non-native and invasive. This plant is a very high priority for removal.

### 3.4 Notes on Other Species

Control of cheatgrass and medusahead can be very difficult and costly. If these grasses are widespread in the region, their control should be a lower priority on MCCWA lands. If they are not widespread, it may be desirable to attempt control or eradication, in coordination with adjacent land owners/managers who also are managing the species.

Velvet grass is sometimes dominant in relatively moist, low-lying areas in grassland habitat types and around seeps. Tall fescue was also documented on the site. These perennial grasses can become monocultures and should be removed.

Bull thistle should be removed, as resources become available, as it also will continue to spread and increase in density.

The following non-native trees and arborescent shrubs should be removed as resources permit as many of them will continue to spread and usurp resources: edible fig, black walnut, southern catalpa, silk tree, firethorn, plum, and white poplar.

#### 4.0 CONSIDERATIONS FOR SPECIES-SPECIFIC MANAGEMENT STRATEGIES

Management strategies for non-native invasive plants must be species-specific, and sometimes specific to individual occurrences. For example, it may be safe to use herbicides on some occurrences, but others may be too close to water or rare species. All pesticide applications made on department-managed lands or for department-managed projects must first be approved by the department's pesticide use coordinator, a pest control adviser licensed by the California Department of Pesticide Regulation (DPR) and assigned to the department's Pesticide Investigations Unit (PIU) (CDPR 2006). CDFG's Pesticide Investigation Unit focuses on five general categories of pesticide work:

- 1) Incident investigations involving fish and wildlife and pesticides;
- 2) Hazard assessments of pesticides to fish and wildlife resources;
- 3) Protection of threatened and endangered species from pesticide use;
- 4) Assessment of pest control and eradication programs on fish and wildlife resource; and
- 5) Coordination and approval of Department pesticide uses and training of CDFG personnel.

PIU staff works closely with Department of Food and Agriculture, Department of Pesticide Regulations, and County Agriculture Commissioner staffs (CDFG 2009). Requests to use pesticides must be submitted to the PIU on the department's pesticide use request form (FG-880) at least 30 days before the intended use date. No pesticide applications can be made to department-managed lands without an approved FG-880 from the PIU. Copies of approved FG-880s must be maintained by department pesticide applicators for at least two years after the pesticide application date. This requirement does not apply to the control of indoor and landscape pests associated with department-managed buildings.

Except as indicated below, all pesticide applications made on department-managed lands or for department-managed projects must be supervised by department personnel who have obtained their qualified applicator certificate from the DPR.

Exceptions to this requirement include the following situations:

- 1) indoor and landscape pest control at department-managed facilities,
- 2) pesticide applications made by DPR-licensed commercial pest control companies, vector control districts, or similar agencies, and
- 3) pesticide applications made by farmers to crops grown under lease agreements with the department.

Herbicides and pesticides are considered hazardous materials and even with the best of care, accidents do occasionally happen. Appendix D-4 of this document contains contact information concerning local medical treatment facilities. This information should be kept up to date by MCCWA area managers.

## 4.1 Basic Treatment Options

This section provides general information on techniques to control or eradicate some of the high priority species listed in Table 2. Prior to finalizing treatment protocols, site managers will need to collect additional information on specific locations of infestations.

The following list presents the basic menu of treatment options available for land managers for removing or slowing spread of non-native plants. These can be used separately or in combination:

- prevention of spread by stopping ongoing soil disturbance
- manual removal (hand pulling)
- mechanical removal (mowing, weed-whacking)
- controlled grazing {cattle, sheep or goats}
- prescribed fire or scorching
- herbicide application

## 4.2 Notes of Treatments for Highest Priority Species

The following sections provide some of the treatment options available for the highest priority species on MCCWA lands as presented in Table 2. Much of this information is derived from the [Cal-IPC website](#).

### 4.2.1 Tree-of-Heaven

- 1) Pull seedlings before taproot is established (roughly 3 months after germination) while soil is moist and loose. If taproot has already formed, dig around base of plant to completely remove root system and prevent resprouts.
- 2) Grubbing out the taproot can kill the plant, but is a slow method best used to control small infestations. The entire root must be removed, as any portion left in the soil can produce a new plant.
- 3) Cut stems of mature trees (up to 12 inches in diameter) early in the spring. Cut a second time at the end of the growing season around June or July. This aims to prevent seed production with the first cut and to exhaust the plant's energy reserves with the second cut.
- 4) Cut the tree with a chainsaw, preferably during the growing season and before it flowers. Immediately treat the cut with herbicide.
- 5) Slash from trees that have not produced seed can be piled for wildlife cover.
- 6) Any seeds present are best collected, bagged, and disposed of.
- 7) Establishing a thick shade over seedlings will slow their growth.
- 8) Follow-up: Return to the site to pull any seedlings that have germinated. New seedlings and root suckers can be pulled or cut and treated with herbicide. Cut resprouts repeatedly for 3–4 years to kill off the plant's root system.



### 4.2.2 Giant Reed

- 1) Completely killing the root system is the only way to remove giant reed, either through physical removal or with herbicide.
- 2) Pulling and cutting can be effective if all rhizomes and aboveground vegetation are removed.
- 3) Apply herbicides as follow-up to pulling or digging. The more thoroughly the rhizomes are removed, the less herbicide will be needed.
- 4) Pull or dig plants, from seedlings to 6 feet tall, ideally after heavy rains loosen the soil. It is important to pull up and remove the roots.
- 5) Cut stems of larger plants with a chainsaw or brush cutter, and dig up roots with a shovel, pickaxe, or Swedish brush axe. Alternatively, use heavy equipment, such as an excavator.
- 6) Cut stems as close to the ground as possible in May, and cover the clump with a very thick tarp or with several tarps for an entire growing season. This should prevent light from reaching the plant (reducing its ability to photosynthesize), and keep resprouts from tearing the tarp. The lack of light will eventually deplete the plant's energy reserves and it will die back.
- 7) Foliar herbicide spraying can be successful after the plant has flowered but before summer dormancy.
- 8) As an alternative to foliar spraying, a stronger concentration of herbicide can be applied to stems immediately after cutting. Make sure that an herbicide product suitable for use near water is used.
- 9) Both treated and non-treated stems can be left on-site to decompose, although they break down very slowly. If left to compost, keep debris well away from water. For stems that have not been chemically treated and in areas where it is feasible, the debris can be burned. Otherwise, chip canes into very small pieces for mulching. The stems are easier to chip when dry. Chipping giant reed requires a heavy-duty chipper to handle the plant's tough fibers.
- 10) Chipped material can be disposed of either in green waste containers, or spread out to dry and possibly sprayed with herbicide if any regrowth occurs from chipped debris. Stem pieces that have no nodes or only one node won't reproduce.
- 11) Follow-up: Return to the site to pull any new seedlings. New seedlings and root suckers can be pulled or cut and treated with herbicide. Cut re-sprouts repeatedly for 3–4 years to kill off the plant's root system.

### 4.2.3 Yellow Star-thistle

There is a wealth of information available on treatment of yellow star-thistle. For example, see the 2006 *Yellow Starthistle Management Guide* by Joseph M. DiTomaso, Guy B. Kyser, and Michael J. Pitcairn <http://www.cal-ipc.org/ip/management/yst.php>

- 1) Pull or dig individual plants by hand in May–June, when plants are bolting or as soon as possible afterwards. (Rosettes often break off from roots, which resprout.) Grasp the plant at the base and pull steadily, straight up.
- 2) Where several plants grow close together, digging or pulling smaller ones often makes it easy to pull others. Cutting lateral roots and loosening soil around the base also make it easier to pull. If the plant cannot be pulled out, cut it or twist it off at the base. Hand pulling is often difficult if plants have stems more than a quarter-inch in diameter.
- 3) Use a narrow spade, soil knife, or other tool to help free or cut the root. Given that this weed is an annual, most of the taproot can be left in the soil, especially if the cut is a quarter- to a half-inch of the root below the root crown.
- 4) Continue to recheck and pull emerging plants through August, preferably even later.
- 5) Hand-pulling can be done in conjunction with mowing: mowing can keep plants from setting seed until you have time to pull.
- 6) Mow (or cut with a hand scythe, brushcutter, or any cutting tool) after the plants have bolted and a small fraction of the buds (about 2 percent) have started to bloom. If mowed, the blades must be close enough to the ground to get the lowest buds. Aim to leave 1–2 inches above ground. The site may need to be mowed a second or even a third time at 4–6 week intervals. Mowing too early can encourage greater seed production, so it's crucial to time the removal carefully. If there are no buds, it's too early, but if the flowers have mostly bloomed and are losing their bright yellow color, it's too late. Occasionally plants bolt sideways with flower heads much closer to the ground, or mowed plants may rebloom very low. These tops can be removed with a shovel, hoe, or mattock, if in small numbers. Cutting is most effective on dry soil, otherwise a repeat treatment is necessary roughly 4 weeks later.
- 7) Graze with cattle, goats, and sheep to help contain plants and reduce seed production. While cattle don't eat mature spiny plants, goats and sheep will. Best results come from intensive grazing by a large number of animals for a short period, preferably from the end of May to June, just after plants have bolted. Research suggests grazing at the rosette stage is counterproductive, leading to an increase in yellow starthistle. This weed is toxic to horses.
- 8) Some practitioners advise leaving clippings from each mowing on-site (as long as they do not contain seeds) to protect reinfestation by other invasive species, and also to discourage yellow starthistle seedlings by providing extra shade. Plants with only buds and young, pale yellow flowers can be left on the ground. Once flowers turn darker yellow, pulled plants should be bagged, as they may produce viable seed. Dispose of the bags off-site where seeds can't disperse elsewhere.
- 9) Mulching may be helpful in shading out seedlings. Some experiments show that a 5-inch layer of wheat straw (or rice straw) stops all regrowth. This level of coverage might be expensive, however, and therefore is only an option for small patches.

- 10) Follow-up: A removal program should last at least 3 years and probably longer, though at lower intensity. Watch for new infestations in nearby areas.

#### 4.2.4 Himalayan Blackberry

- 1) Cut stems with loppers close to the ground.
- 2) Dig out the rootball with a Pulaski or shovel, and remove as much of the root as possible. Interconnecting roots reaching over 30 feet long and 2–3 feet deep make pulling up all roots extremely difficult. Aim to remove the main rootball and large lateral roots.
- 3) Brushcut the canes; use McLeods to clear the vegetation. The best time to do this is when flowers are in bloom but before fruit sets. Cutting encourages new growth, but may be effective if repeated over a number of years.
- 4) Some cut stems to about 1 foot and treat stumps with strong solution (25–50 percent concentration) of herbicide immediately after cutting. Don't use herbicide on or near plants from which people may pick and eat the berries.
- 5) Transfer stems and roots to a site where they can be left to decompose, making sure that to remove all berries. Alternatively, burn the debris or trim it into pieces small enough for bagging and disposal.
- 6) Goats will graze on younger plants.
- 7) There are no viable biological resources for this invasive plant due to its closeness to native *Rubus* species.
- 8) Follow-up: Regardless of the method used, follow-up is essential. Some recommend immediate revegetation with quick-growing shrubs and trees, with periodic visits to the site to remove seedlings and regrowth. After removing canes, one option is to hoe the soil or use a rototiller. This will clear out any roots, but is practical only for small monocultures.

#### 4.2.5 Parrotfeather

The following control methods have been compiled from the [Washington State Noxious Weed Control Board](#) and the [Georesources Institute, the Minnesota State University](#) websites .

- 1) Herbicides are the most common means of controlling parrotfeather.
- 2) Generally, only broadcast herbicide treatments have been applied to parrotfeather and little information is available on subsurface applications. Currently, no herbicide has been shown to be totally effective in controlling parrotfeather without repeated applications over time.

- 3) While parrotfeather is susceptible to herbicides, it is difficult to achieve complete control. The emergent stems and leaves have a thick waxy cuticle and it requires a wetting agent to penetrate this cuticle. Often the weight of the spray will cause the emergent vegetation to collapse into the water where the herbicide is washed off before it can be translocated throughout the plant.
- 4) Because this plant can spread readily through fragmentation of rhizomes, mechanical controls such as cutting, harvesting, and rotoation (underwater rototilling) should be used only when the extent of the infestation is such that all available niches have been filled. Using mechanical controls while the plant is still invading will tend to enhance its rate of spread.
- 5) Parrotfeather populations can be successfully harvested, but the dense tough rhizomes are very heavy and the plant regrows rapidly. In Longview, Washington, a dragline is used to remove parrotfeather plants. A truck-mounted crane with a special attachment plucks weeds out of the ditch. The drag line operation is conducted from August to December each year with control generally lasting for one growing season.
- 6) Parrotfeather has a high tannin content, so most grazers find it unpalatable.
- 7) Biological control agents are not presently available, but research for potential agents (pests and fungal controls) is ongoing and may be available in the near future.
- 8) Hand pulling and harvesting may offer temporary control on small infestations of less than one acre.
- 9) Raking may not be feasible due to the rapid biomass production of parrotfeather, as dense mats are likely heavy and may damage equipment. Care must be taken to remove all plant parts (emergent shoots, submersed shoots, and roots) as well as fragments or re-growth will occur.
- 10) Drawdowns may offer control in some situations, however, all water must be removed to facilitate compete drying of bottom sediments since parrotfeather will root and survive in moist soil.
- 11) Dredging is generally very expensive and not feasible for most management situations.

#### **4.2.6 Perennial Pepperweed**

- 1) Hand pulling is feasible only for seedlings. Established plants have a continuous mass of deep, interconnected roots that frequently break. Each segment can vegetatively reproduce, making it critical to grub out as much of the root system as possible.
- 2) Mechanical removal is not recommended given the plant's ability to spread easily from root fragments, but it will temporarily stop seed from spreading.

- 3) It may be possible to cut this plant back prior to flowering, and then cover the root system with cardboard or landscape fabric for a year to reduce the plant's ability to resprout.
- 4) Some studies suggest that an early season mowing can dramatically shift the total leaf area and the location of the leaf area within the plant canopy. Resprouting stems had 21-59% less leaf area than plants not mowed at the flowerbud stage. In mowed areas, 84-86% of the leaf area was found within the lower third of the canopy. If herbicide applications are made to resprouted shoots, more herbicide will be deposited onto the lower third of the canopy. This may in turn lead to the translocation and accumulation of more herbicide to below-ground perennial organs, enhancing control (Renz 2000).
- 5) The optimal timing for herbicide applications is the flowerbud stage. In riparian or wetland habitat, use a product that is not toxic to aquatic organisms and apply with a wick-type applicator to prevent herbicide drift.
- 6) Sheep and goats will graze on perennial pepperweed if the leaves are still young and there is nothing else to eat.
- 7) Keep roots away from waterways to minimize further infestations downstream. Wash equipment and the tires and undersides of vehicles after leaving the site.
- 8) Bag and dispose of pulled plants as household garbage or take them to a green waste facility. Alternatively, dispose of the plants through hot compost with grinding (but not ordinary compost, as very small fragments will reroor).
- 9) Any revegetation should be carried out as soon as possible. Natives with creeping perennial roots may be best.
- 10) Follow-up: Regular follow-up is essential as roots can lay dormant underground for several years. Return to the site in early spring and late summer for several years to check for regrowth and to remove rosettes. Scrape litter from the soil surface to allow other species to grow. Soil remediation may be required before planting native species.

#### **4.2.7 Water Primrose**

- 1) Water primrose can be cut and the roots can be dug up, but physical control is difficult because it can reestablish from seeds or remaining roots.
- 2) For small populations, hand pulling or raking might be effective. For larger infestations, a mechanical harvester or rotoation might be used.
- 3) Small populations may be tarped; however, covering large populations can cause a drop in dissolved oxygen (DO) that can affect other plants and fish.
- 4) Goats are known to forage on many types of emergent vegetation.
- 5) There is no known biological control for water primrose, although research is ongoing to try to find such an agent.

## 5.0 FOLLOW-UP MONITORING FOR TREATMENT EFFECTIVENESS

Follow-up monitoring to determine the effectiveness of treatments is a critical component of a successful non-native plant management program. Monitoring is valuable for providing information on the following:

- Progress of removal efforts;
- Effectiveness of treatments;
- Degree of re-establishment of target species after removal treatments have been applied (i.e., presence of seedlings or re-sprouts);
- Length of time follow-up visits are necessary;
- Status of natural or imposed re-vegetation on treated sites (e.g., the Proportion of native vs. non-native plants re-colonizing the area); and
- Use of the treated area by native wildlife.

Monitoring and documentation also are valuable for reporting on the use of project funding, as well as for information transfer with other land managers dealing with similar species.

Monitoring can be either qualitative or quantitative. Selection of methods will be contingent on the specific objectives and on available funding, and should be prioritized as removal and control efforts are prioritized. The [Center for Invasive Plant Management](#) offers the following information on examples of low, moderate, and high intensity monitoring and corresponds to the MCCWA LMP Section IV-B, Biological Monitoring Elements.

### 1. Low Intensity (Level I)

*Objective:* To detect new infestations and to assess the success of small scale chemical or mechanical control programs.

- a. Annually survey size and density of weed infestations and vegetation trends.
- b. Assemble data on past and current weed control activities within the weed management area.
- c. Annually update distribution/density map.
- e. Annually examine areas that are determined to be particularly susceptible to weed infestations.

### 2. Moderate Intensity (Level II)

*Objective:* Assess the success of ongoing chemical, biological control, or prevention programs in order to evaluate the need for adjustments.

Include the elements of Level I, plus:

- a. Establish permanent transects to aid visual monitoring.
- b. Establish photo points. Catalog and store photos so they are useful for recording trends.
- c. Collect weather data. This will require access to weather records and Palmer Drought Index.
- d. Evaluate the success of public education programs.
- e. Monitor funding from various sources.
- f. Assess the prevention effort.
- g. Compare the success of application timing, rates, and methods of treatment with that of applications on similar areas.
- h. Make an annual visual inspection for symptoms of damage to desirable plants.
- i. Make post-treatment inspections to determine possible damage and the need for retreatment.

### **3. High Intensity (Level III)**

*Objective:* Assess the success of major, sensitive, or experimental control programs.

Include the elements of Levels I and II, plus:

- a. This level may require the use of statistical and chemical analysis.
- b. Establish a computerized database. Geographical Information Systems (GIS) lend themselves to this level of monitoring.
- c. Automatic weather stations may be used to collect data.
- d. May require more detailed maps.
- e. Collect data on ground water, soils, health effects and impacts on wildlife management.

Also note that weed-free areas also deserve rigorous monitoring. Preventing weeds from becoming established is the most effective, economical, and ecologically sound approach to managing non-native plant infestations at the MCCWA.

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**Appendix D-1: Introduced or Naturalized Vascular Plant Species Observed**  
Mouth of Cottonwood Creek Wildlife Area (Cottonwood Creek and Balls Ferry Wetland Unit 1), Shasta County, California

Vascular Plant Observed	CCU	BFW1
<b>FLOWERING PLANTS (ANGIOSPERMAE - DICOTYLEDONEAE)</b>		
APIACEAE		
<i>Anthriscus caucalis</i>	X	
<i>Daucus carota</i>	X	X
<i>Torilis arvensis</i>	X	X
ARALIACEAE		
<i>Hedera helix</i>		X
ASTERACEAE		
<i>Anthemis cotula</i>		X
<i>Centaurea solstitialis</i>	X	X
<i>Chamomilla suaveolens</i>	X	X
<i>Cichorium intybus</i>	X	X
<i>Cirsium vulgare</i>	X	X
(?) <i>Conyza</i> sp.	X	
<i>Filago gallica</i>		X
<i>Gnaphalium luteo-album</i>	X	X
<i>Hypochaeris glabra</i>	X	X
<i>Hypochaeris radicata</i>	X	X
<i>Lactuca serriola</i>	X	X
<i>Leontodon taraxacoides</i> ssp. <i>longirostris</i>	X	X
<i>Senecio vulgaris</i>	X	
<i>Silybum marianum</i>	X	
<i>Sonchus asper</i>	X	X
<i>Tragopogon dubius</i>	X	X
BIGNONIACEAE		
<i>Catalpa bignonioides</i>	X	
BORAGINACEAE		
<i>Heliotropium europaeum</i>	X	X
BRASSICACEAE		
<i>Brassica nigra</i>	X	X
<i>Lepidium latifolium</i>	X	
<i>Raphanus raphanistrum</i>	X	X
CAPRIFOLIACEAE		
<i>Lonicera japonica</i>		X

Vascular Plant Observed	CCU	BFW1
CARYOPHYLLACEAE		
<i>Cerastium glomeratum</i>		X
<i>Herniaria hirsuta</i> ssp. <i>hirsuta</i>		X
<i>Petrorhagia dubia</i>	X	X
<i>Spergularia rubra</i>	X	X
CHENOPODIACEAE		
<i>Chenopodium ambrosioides</i>	X	
<i>Chenopodium botrys</i>	X	
CONVOLVULACEAE		
<i>Convolvulus arvensis</i>	X	X
DIPSACACEAE		
<i>Dipsacus fullonum</i>	X	
FABACEAE		
<i>Albizia</i> sp.		X
<i>Lathyrus</i> cf. <i>hirsutus</i>		X
<i>Lotus corniculatus</i>	X	X
<i>Medicago polymorpha</i>	X	
<i>Trifolium campestre</i>		X
<i>Trifolium dubium</i>	X	X
<i>Trifolium glomeratum</i>		X
<i>Trifolium hirtum</i>	X	X
<i>Trifolium pratense</i>		X
<i>Trifolium repens</i>	X	X
<i>Trifolium subterraneum</i>	X	X
<i>Vicia benghalensis</i>	X	X
<i>Vicia sativa</i> ssp. <i>nigra</i>	X	X
GERANIACEAE		
<i>Erodium brachycarpum</i>	X	X
<i>Erodium cicutarium</i>	X	
<i>Geranium dissectum</i>	X	X
HALORAGACEAE		
<i>Myriophyllum aquaticum</i>	X	X
JUGLANDACEAE		
<i>Juglans californica</i> var. <i>hindsii</i>	X	X
LAMIACEAE		

Vascular Plant Observed	CCU	BFW1
<i>Marrubium vulgare</i>	X	
<i>Mentha pulegium</i>	X	X
LINACEAE		
<i>Linum bienne</i>	X	X
LYTHRACEAE		
<i>Lythrum hyssopifolium</i>	X	X
MORACEAE		
<i>Ficus carica</i>	X	X
<i>Morus alba</i>	X	
ONAGRACEAE		
<i>Ludwigia peploides</i> ssp. <i>montevidensis</i>		X
PHYTOLACCACEAE		
<i>Phytolacca americana</i>	X	X
PLANTAGINACEAE		
<i>Plantago lanceolata</i>	X	X
POLYGONACEAE		
<i>Polygonum arenastrum</i>	X	X
<i>Rumex acetosella</i>		X
<i>Rumex conglomeratus</i>		X
<i>Rumex crispus</i>	X	X
<i>Rumex cf. kernerii</i>	X	
<i>Rumex pulcher</i>	X	X
PRIMULACEAE		
<i>Anagallis arvensis</i>	X	
RANUNCULACEAE		
<i>Ranunculus muricatus</i>		X
ROSACEAE		
<i>Prunus</i> sp.	X	X
<i>Pyracantha angustifolia</i>		X
<i>Rubus discolor</i>	X	X
<i>Rubus pensilvanicus</i>		X
RUBIACEAE		
(?) <i>Galium aparine</i>	X	
<i>Galium parisiense</i>	X	X
<i>Sherardia arvensis</i>		X
SALICACEAE		

Vascular Plant Observed	CCU	BFW1
<i>Populus alba</i>	X	
SCROPHULARIACEAE		
<i>Parentucellia viscosa</i>	X	X
<i>Verbascum blattaria</i>	X	X
<i>Veronica anagallis-aquatica</i>	X	
<i>Veronica catenata</i>		X
SIMAROUBACEAE		
<i>Ailanthus altissima</i>	X	X
SOLANACEAE		
(?) <i>Nicotiana</i> sp.	X	
VERBENACEAE		
<i>Verbena bonariensis</i>	X	
VITACEAE		
<i>Vitis vinifera</i>	X	X
ZYGOPHYLLACEAE		
<i>Tribulus terrestris</i>	X	
<b>FLOWERING PLANTS (ANGIOSPERMAE - MONOCOTYLEDONEAE)</b>		
ALISMATACEAE		
<i>Alisma lanceolata</i>		X
IRIDACEAE		
<i>Iris pseudacorus</i>	X	
POACEAE		
<i>Aira caryophyllea</i>	X	X
<i>Arundo donax</i>	X	X
<i>Avena barbata</i>	X	X
<i>Briza minor</i>	X	X
<i>Bromus diandrus</i>	X	X
<i>Bromus hordeaceus</i>	X	X
<i>Bromus madritensis</i> ssp. <i>rubens</i>	X	
<i>Bromus tectorum</i>	X	
<i>Cynodon dactylon</i>		X
<i>Cynosurus echinatus</i>	X	X
<i>Dactylis glomerata</i>	X	X
<i>Festuca arundinacea</i>	X	X
<i>Festuca pratensis</i>	X	X
<i>Glyceria declinata</i>	X	X
<i>Holcus lanatus</i>	X	X

<b>Vascular Plant Observed</b>	<b>CCU</b>	<b>BFW1</b>
<i>Hordeum marinum</i> ssp. <i>gussoneanum</i>	X	X
<i>Hordeum murinum</i> ssp. <i>leporinum</i>	X	X
<i>Lolium multiflorum</i>	X	X
<i>Lolium perenne</i>	X	X
<i>Paspalum dilatatum</i>		X
<i>Poa annua</i>		X
<i>Poa bulbosa</i>	X	
(?) <i>Poa pratensis</i>	X	X
<i>Polypogon monspeliensis</i>		X
<i>Secale cereale</i>	X	
<i>Sorghum</i> sp.	X	
<i>Taeniatherum caput-medusae</i>	X	X
<i>Vulpia bromoides</i>	X	X
<i>Vulpia myuros</i> var. <i>myuros</i>	X	X

## Appendix D-2: Additional Resources

(From Montana State University's Center for Invasive Plant Management;  
[http://www.weedcenter.org/management/mgmt\\_overview.html](http://www.weedcenter.org/management/mgmt_overview.html))

### Developing a Weed Management Plan

[Adaptive Weed Management Plan Template](#) from [The Nature Conservancy](#). A three-part tool: (1) An introduction to the philosophy of adaptive management. (2) Weed Management Plan Template, including boiler-plate language to ease the planning process and help prioritize weeds. (3) Excel workbook to keep track of your work and costs.

[Weed Information Management System \(WIMS\)](#) from The Nature Conservancy. WIMS keeps track of weed occurrences (GPS point locations), assessments (size and status of the weed infestation to facilitate monitoring over time), and management treatments applied to those weed infestations.

[Creating an Integrated Weed Management Plan](#)—A Handbook for Owners and Managers of Lands with Natural Values. Volume IV in "Caring for the Land Series, from the [Colorado Natural Areas Program](#). Provides the tools and information necessary for public and private landowners to manage noxious weeds successfully in natural areas, wildlands, and rangelands. Free downloads (pdf file) on the website.

[Invasive Exotic Plant Management Tutorial for Natural Lands Managers](#) A "one-stop-shop" for natural resource managers who are interested in organizing on-the-ground efforts to prevent, manage and control IEPs. From Mid-Atlantic Exotic Pest Plant Council, Inc., and PA Dept. of Conservation and Natural Resources.

[Seven Steps to Managing Your Weeds](#): A Guide to Integrated Management in British Columbia (pdf).

### Prioritizing Weed Threats

The [Criteria System](#) for categorizing invasive non-native plants that threaten wildlands. Page 7 in [Cal-IPC 2006 Invasive Plant Inventory](#) (pdf)

[Evaluating Risk to Native Plant Communities from Selected Exotic Plant Species](#) Developed by the Forest Service to help land managers identify the native plant communities most threatened by invasive plants. Land managers in Montana and Northern Idaho can use this program to prioritize and strategize their weed management efforts.

[Invasive Species Assessment Protocol](#): Evaluating Non-Native Plants for Their Impact on Biodiversity (Morse, et. al., [NatureServe](#), 2004). The protocol is designed to make the process of assessing and listing invasive plants objective, systematic, and transparent and will help set priorities focusing scarce management resources.

[Measuring Plant Diversity: Lessons from the Field](#). Because resident native diversity can affect the likelihood of invasion by non-native plants, it is critical that scientists accurately assess the composition of plant communities over large areas. A newly released book by USGS ecologist Tom Stohlgren, *Measuring Plant Diversity: Lessons from the Field* (Oxford University Press, 2006), presents field and analysis methods that can more accurately describe plant biodiversity and help evaluate vulnerability to invasion.

## Inventory and Survey

[California Weed Mapping Handbook](#). Provides information on (1) shared data standards, so that different data sets will be compatible, and (2) “how to” instructional information on mapping techniques. Its aim is to help those working on weed issues to develop mapping systems that will support project goals on both a local and state level. PDF (2 MB) download on website.

[A field manual for surveying and mapping nationally significant weeds \(pdf\)](#). I McNaught, R Thackway, L Brown & M Parsons; published by Australia's [Bureau of Rural Sciences](#), 2006. A 52-page manual explaining standardized, systematic procedures for collecting core weed infestation data for mapping those plants that are Australia's 20 "weeds of national significance."

[Guidelines for Terrestrial Weed Mapping and Inventory in Idaho](#) (pdf).

[Introduction to Mapping Noxious Weeds in Montana](#). Inventory and Survey Methods for Nonindigenous Plant Species. MSU Extension Publications, Sept. 2006. Practical information for sites of any size, staffing level, or budget. Color photos, maps, and diagrams; 80 p. \$20 includes shipping and handling. For discounts on orders of 25 or more, email [dbrokke@montana.edu](mailto:dbrokke@montana.edu). Order Publication EB 0171 from [MSU Extension Publications](#), P.O. Box 172040, Bozeman, MT 59717-2040. Phone: 406-994-3273; email: [orderpubs@montana.edu](mailto:orderpubs@montana.edu)

[Map Important Weeds for A Living Inventory](#), part of the [War on Weeds](#) series from University of Nevada [Extension Publications](#).

[Mapping Standards from NAWMA](#) (the North American Weed Management Association).

[Montana Noxious Weed Survey and Mapping System](#) — Guidelines for a statewide mapping project.

[Non-native Plants of the Kenai Peninsula: Summary of a 2-year Roadside Inventory](#)  
Example of a [baseline inventory](#), conducted across the Kenai Peninsula by the KP-CWMA.

[Remote sensing of invasive plants](#), on the [TNC Invasive Species Initiative](#) website. An introduction intended to help land managers decide if remote sensing could be a useful tool for them.

[Weed Manager's Guide to Remote Sensing and GIS](#) from the USDA Forest Service.  
[Vegetation Mapping Program](#) from NPS.



[YST Mapping Project](#). Detailed methods, forms, and sample maps used in Cooperative Western Sierra Nevada Yellow Starthistle Mapping & Assessment Project.  
Monitoring

[Invasive Species Monitoring Resources](#) from NPS. Guidelines, protocols, assessment, references, and more.

[Measuring and Monitoring Plant Populations \(5.3 MB pdf\)](#). Elzinga, Salzer, and Willoughby. 2001. BLM Technical Reference 1730-1. 492 pp. Order print copies from [BLM Library](#) or email [BLM\\_NCS\\_PMDS@blm.gov](mailto:BLM_NCS_PMDS@blm.gov). Also available from online and retail booksellers.

[Monitoring: How Can I Monitor without Spending a Lot of Time and Money?](#) From USDA Forest Service [A Weed Manager's Guide to Remote Sensing and GIS](#).

[Monitoring Changes in Exotic Vegetation](#), by Robert D. Sutter, TNC. " An overview of the most important monitoring issues, modified to address the management of exotics."

[Monitoring of Non-Indigenous Plant Species](#), by Bruce Maxwell, in [CIPM's Online Invasive Plant Management Textbook](#).

## Other References

Booth, B. D., S. D. Murphy, and C. J. Swanton. 2003. [Weed ecology in natural and agricultural systems](#). CABI Publishing, Wallingford, Oxfordshire, UK.

Explains ecological principles essential to understanding how weeds function in the environment. Emphasizes why weed management strategies within an integrated weed management approach should be based on ecological knowledge. Requires only an understanding of basic biology. Covers population ecology, community ecology, the importance of weed ecology to weed management.

Luken, J. O., and J. W. Thieret. 1997. Assessment and management of plant invasions. Springer-Verlag, New York.

Attempts to cast the issue of non-indigenous plant invasion in a broader ecological context that includes humans acting as managers of natural resources, designers of regulations, and disperses of organisms. Addresses important ecological interactions that emerge prior to plant invasion, as well as post-management interactions.

McPherson, G. R., and S. DeStefano. 2003. Applied ecology and natural resource management. Cambridge University Press, Cambridge, UK.

Practical guidelines for integrating applied ecology with natural resource management; describes how concepts and approaches used by ecologists to study communities and ecosystems can be applied to management.

National Research Council. 1996. [Ecologically based pest management: New solutions for a new century](#). National Academy Press, Washington, DC.

(Scroll down for table of contents.) Ecologically based pest management (EBPM) is recommended as a profitable, safe, and durable approach to controlling pests in managed ecosystems. (Excerpt from [Executive Summary](#))

Radosevich, S., J. Holt, and C. Ghera. 1997. Weed ecology: Implications for management, 2nd ed. John Wiley & Sons, Inc., New York.

By considering weeds foremost as plants and by relying on the concepts of plant ecology, the authors hope to provide a better understanding of weeds that will lead to better crop and weed management.

Sheley, R. L., T. J. Svejcar, and B. D. Maxwell. 1996. A theoretical framework for developing successional weed management strategies on rangeland. *Weed Technology* 10: 766-773.

Provides the mechanistic framework necessary for developing successional weed management systems that shift plant communities to a desired state.

**Appendix D-3: Non-native invasive plants known to occur at MCCWA rated as moderate or high by the California Invasive Plant Council.**

Scientific Name	Common Name	Rating	Alert	Imp.	Inv.	Dis.	Doc.	Regions	Comments
<a href="#"><i>Ailanthus altissima</i></a>	tree-of-heaven	2Moderate	None	B	B	B	3	CA-FP, GV, CaR, CW, GV, NW, SN, SW, MP, SNE	Riparian areas, grasslands, oak woodland. Impacts highest in riparian areas.
<a href="#"><i>Arundo donax</i></a>	giant reed	1High	None	A	B	A	2.8	CW, GV, SN, SW, DMoj, DSon	Riparian areas, commercially grown for musical instrument reeds, structural material, etc.
<a href="#"><i>Avena barbata</i></a>	slender wild oat	2Moderate	None	B	B	A	3.5	D, MP, DMoj, DSon	Coastal scrub, grasslands, oak woodland, forest. Very widespread, but impacts more severe in desert regions.
<a href="#"><i>Brassica nigra</i></a>	black mustard	2Moderate	None	B	B	A	2		Widespread. Primarily a weed of disturbed sites, but can be locally a more significant problem in wildlands.
<a href="#"><i>Bromus diandrus</i></a>	ripgut brome	2Moderate	None	B	B	A	3.3	CA, CaR, CW, GV, NW, SN, SW, D, DMoj, DSon, MP, SNE	Dunes, scrub, grassland, woodland, forest. Very widespread, but monotypic stands uncommon.
<a href="#"><i>Bromus madritensis ssp. rubens</i></a>	red brome	1High	None	A	B	A	3	CA, CaR, CW, GV, NW, SN, SW, D, DMoj, DSon, MP, SNE	Scrub, grassland, desert washes, woodlands
<a href="#"><i>Bromus tectorum</i></a>	downy brome, cheatgrass	1High	None	A	B	A	3.0	D, DMoj, DSon	Interior scrub, woodlands, grasslands
<a href="#"><i>Centaurea solstitialis</i></a>	yellow starthistle	1High	None	A	B	A	3	CA-FP, CaR, CW, GV, NW, SN, SW	Grasslands, woodlands, occasionally riparian
<a href="#"><i>Cirsium vulgare</i></a>	bull thistle	2Moderate	None	B	B	B	3.3	CA-FP, GB, CaR, CW, GV, NW, SN, SW, MP, SNE	Riparian areas, marshes, meadows. Widespread, can be very problematic regionally.

<a href="#"><i>Cynodon dactylon</i></a>	bermudagrass	2Moderate	None	B	B	B	3.3	CA-FP, D, CaR, CW, GV, NW, SN, SW, DMoj, DSon	Riparian scrub in southern CA. Common landscape weed, but can be very invasive in desert washes.
<a href="#"><i>Cynosurus echinatus</i></a>	hedgehog dogtailgrass	2Moderate	None	B	B	A	2.5	CW, GV, NW, SN, SW	Oak woodland, grassland. Widespread, impacts vary regionally, but typically not in monotypic stands.
<a href="#"><i>Dipsacus fullonum</i></a>	common teasel	2Moderate	None	B	B	B	3.8	CW, NW, SN	Grasslands, seep, riparian scrub. Impacts regionally variable, forms dense stands on occasion.
<a href="#"><i>Festuca arundinacea</i></a>	tall fescue	2Moderate	None	B	B	A	2.9	CA-FP, CaR, CW, GV, NW, SN, SW	Coastal scrub, grasslands; common forage grass. Widespread, abiotic impacts unknown.
<a href="#"><i>Ficus carica</i></a>	edible fig	2Moderate	None	B	A	B	2.6	CW, GV, CW	Riparian woodland. Can spread rapidly. Abiotic impacts unknown. Can be locally very problematic.
<a href="#"><i>Geranium dissectum</i></a>	cutleaf geranium	2Moderate	None	C	B	A	1.6	CA-FP, CaR, CW, GV, NW, SN, SW	Numerous habitats but impacts appear minor.
<a href="#"><i>Glyceria declinata</i></a>	waxy mannagrass	2Moderate	None	B	B	B	1.9	GV	Vernal pools, moist grasslands. Often confused with native <i>Glyceria</i> . Impacts largely unknown, but may be significant in vernal pools.
<a href="#"><i>Hedera helix, H. canariensis</i></a>	English ivy, Algerian ivy	1High	None	A	A	A	2.6		Coastal forests, riparian areas. Species combined due to genetics questions.
<a href="#"><i>Holcus lanatus</i></a>	common velvet grass	2Moderate	None	B	B	A	2.9	CA-FP, DMoj, GB, CaR, CW, GV, NW, SN, SW, MP, SNE	Coastal grasslands, wetlands. Impacts can be more severe locally, especially in wetland areas.
<a href="#"><i>Hypochaeris</i></a>	rough catsear,	2Moderate	None	C	B	A	2.2	CA-FP, CaR, CW, GV,	Coastal dunes, scrub, and prairie;

<a href="#"><i>radicata</i></a>	hairy dandelion								NW, SN, SW	woodland, forest. Widespread. Impacts unknown/minor.
<a href="#"><i>Lepidium latifolium</i></a>	perennial pepperweed, tall whitetop	1High	None	A	A	A	3.0	CA-FP, GB		Coastal and inland marshes, riparian areas, wetlands, grasslands; potential to invade montane wetlands.
<a href="#"><i>Lolium multiflorum</i></a>	Italian ryegrass	2Moderate	None	A	B	A	2.6	CA-FP, CaR, CW, GV, NW, SN, SW		Grasslands, oak woodland, pinyon-juniper woodland; widely used for post-fire erosion control. Widespread. Impacts can vary with region.
<a href="#"><i>Ludwigia hexapetala</i></a>	Uruguay water-primrose	1High	Alert	A	B	C	2.6	CW, NW, SW		Freshwater aquatic systems. Clarification needed on taxonomic identification.
<a href="#"><i>Ludwigia peploides</i></a>	creeping water-primrose	1High	None	A	B	B	2.4	CW, GV, NW, SN, SW, DMoj		Freshwater aquatic systems. Clarification needed on taxonomic identification.
<a href="#"><i>Lythrum hyssopifolium</i></a>	hyssop loosestrife	2Moderate	None	C	B	A	3	CA-FP, CaR, CW, GV, NW, SN, SW		Grasslands, wetlands, vernal pools. Widespread. Impacts unknown, but appear to be minor.
<a href="#"><i>Mentha pulegium</i></a>	pennyroyal	2Moderate	None	C	A	A	2.6	CW, GV, NW, SW		Vernal pools, wetlands. Poisonous to livestock. Spreading rapidly. Impacts largely unknown.
<a href="#"><i>Myriophyllum aquaticum</i></a>	parrotfeather	1High	Alert	A	B	C	2.7	CaR, CW, NW, SW		Freshwater aquatic systems
<a href="#"><i>Nicotiana glauca</i></a>	tree tobacco	2Moderate	None	B	B	B	2.5	GV, NW, SN, SW, D, DMoj, DSon		Coastal scrub, grasslands, riparian woodland. Abiotic impacts unknown. Impacts vary locally. Rarely in dense stands.
<a href="#"><i>Rubus armeniacus</i></a> (discolor)	Himalaya blackberry	1High	None	A	A	A	3	CA-FP, CaR, CW, GV, NW, SN, SW		Riparian areas, marshes, oak woodlands

<a href="#"><i>Rumex acetosella</i></a>	red sorrel, sheep sorrel	2Moderate	None	B	B	A	2.3	CA-FP, CaR, CW, GV, NW, SN, SW	Many habitats, riparian areas, forest, wetlands. Widespread. Abiotic impacts unknown. Impacts can vary locally.
<a href="#"><i>Taeniatherum caput-medusae</i></a>	medusahead	1High	None	A	A	A	3.3	CaR, GV, NW, SN, SW	Grasslands, scrub, woodland
<a href="#"><i>Torilis arvensis</i></a>	hedgearsley	2Moderate	None	C	B	B	2.3		Expanding range. Appear to have only moderate ecological impacts.
<a href="#"><i>Trifolium hirtum</i></a>	rose clover	2Moderate	None	C	B	B	2.7	CA-FP, CaR, CW, GV, NW, SN, SW	Grasslands, oak woodland. Widely planted in CA. Impacts relatively minor in most areas.
<a href="#"><i>Vulpia myuros</i></a>	rattail fescue	2Moderate	None	B	B	A	3	CA-FP, D, CaR, CW, GV, NW, SN, SW, DMoj, DSon	Coastal sage scrub, chaparral. Widespread. Rarely forms monotypic stands, but locally problematic

### Cal-IPC Inventory Categories

(Note the previous table includes only plants listed as High or Moderate; see <http://www.cal-ipc.org/ip/inventory/> for species with Limited or Evaluated but Not Listed status)

Plants receive an overall rating of High, Moderate or Limited based on evaluation using the criteria system. The meaning of these overall ratings is described below. In addition to the overall ratings, specific combinations of section scores that indicate significant potential for invading new ecosystems triggers an **Alert** designation so that land managers may watch for range expansions. Some plants were categorized as Evaluated but Not Listed because either we lack sufficient information to assign a rating or the available information indicates that the species does not have significant impacts at the present time.

**High** – These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.

**Moderate** – These species have substantial and apparent—but generally not severe—ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high

rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.

### Geographic Region Codes:

Regions invaded based on Jepson geographic regions. Click on the region code to search for weeds by region.

<CA-FP>	California Floristic Province	<D>	Desert Province	<GV>	Great Valley	<GB>	Great Basin Province
<CaR>	Cascade Range	<DMoj>	Mojave Desert	<NW>	Northwest	<MP>	Modoc Plateau
<CW>	Central West	<DSon>	Sonoran Desert	<SW>	Southwest	<SNE>	Sierra Nevada East
<SN>	Sierra Nevada						

### Column heading abbreviations:

Imp. = Impact  
 Inv. = Invasiveness  
 Dis = Distribution  
 Doc. = Documentation Level  
 (documentation level averaged)

### Scores:

A = Severe  
 B = Moderate  
 C = Limited  
 D = None  
 U = Unknown

### Nomenclature:

Scientific names are based on The Jepson Manual. For each species, the first common name is based on the Weed Science Society of America's "Composite List of Weeds", followed by other names used in California.

### Citation:

Cal-IPC. 2006. California Invasive Plant Inventory. Cal-IPC Publication 2006-02. California Invasive Plant Council: Berkeley, CA. Available: [www.cal-ipc.org](http://www.cal-ipc.org).

#### **Appendix D-4: Emergency Information**

##### **CDFG to provide additional information**

The nearest hospitals and medical clinics are located in Red Bluff and Redding, California:

St Elizabeth Community Hospital 2550 Sister Mary Columbia Dr, Red Bluff, CA  
(530) 529-8000 (About 15 miles south of Cottonwood)

MERCY MEDICAL CENTER 2175 Rosaline Ave, Redding, 96001 - (530) 225-  
6000 (about 16 miles north of Cottonwood)

**Provide directions and maps to closest hospitals and clinics. Be sure emergency phone numbers and directions are kept current.**



**Appendix D-3: Non-native invasive plants known to occur at MCCWA rated as moderate or high by the California Invasive Plant Council.**

Scientific Name	Common Name	Rating	Alert	Imp.	Inv.	Dis.	Doc.	Regions	Comments
<a href="#"><i>Ailanthus altissima</i></a>	tree-of-heaven	2Moderate	None	B	B	B	3	CA-FP, GV, CaR, CW, GV, NW, SN, SW, MP, SNE	Riparian areas, grasslands, oak woodland. Impacts highest in riparian areas.
<a href="#"><i>Arundo donax</i></a>	giant reed	1High	None	A	B	A	2.8	CW, GV, SN, SW, DMoj, DSon	Riparian areas, commercially grown for musical instrument reeds, structural material, etc.
<a href="#"><i>Avena barbata</i></a>	slender wild oat	2Moderate	None	B	B	A	3.5	D, MP, DMoj, DSon	Coastal scrub, grasslands, oak woodland, forest. Very widespread, but impacts more severe in desert regions.
<a href="#"><i>Brassica nigra</i></a>	black mustard	2Moderate	None	B	B	A	2		Widespread. Primarily a weed of disturbed sites, but can be locally a more significant problem in wildlands.
<a href="#"><i>Bromus diandrus</i></a>	ripgut brome	2Moderate	None	B	B	A	3.3	CA, CaR, CW, GV, NW, SN, SW, D, DMoj, DSon, MP, SNE	Dunes, scrub, grassland, woodland, forest. Very widespread, but monotypic stands uncommon.
<a href="#"><i>Bromus madritensis ssp. rubens</i></a>	red brome	1High	None	A	B	A	3	CA, CaR, CW, GV, NW, SN, SW, D, DMoj, DSon, MP, SNE	Scrub, grassland, desert washes, woodlands
<a href="#"><i>Bromus tectorum</i></a>	downy brome, cheatgrass	1High	None	A	B	A	3.0	D, DMoj, DSon	Interior scrub, woodlands, grasslands
<a href="#"><i>Centaurea solstitialis</i></a>	yellow starthistle	1High	None	A	B	A	3	CA-FP, CaR, CW, GV, NW, SN, SW	Grasslands, woodlands, occasionally riparian
<a href="#"><i>Cirsium vulgare</i></a>	bull thistle	2Moderate	None	B	B	B	3.3	CA-FP, GB, CaR, CW, GV, NW, SN, SW, MP, SNE	Riparian areas, marshes, meadows. Widespread, can be very problematic regionally.
<a href="#"><i>Cynodon dactylon</i></a>	bermudagrass	2Moderate	None	B	B	B	3.3	CA-FP, D, CaR, CW, GV,	Riparian scrub in southern CA.

APPENDIX D: MCCWA WEED MANAGEMENT PLAN

								NW, SN, SW, DMoj, DSon	Common landscape weed, but can be very invasive in desert washes.
<a href="#"><i>Cynosurus echinatus</i></a>	hedgehog dogtailgrass	2Moderate	None	B	B	A	2.5	CW, GV, NW, SN, SW	Oak woodland, grassland. Widespread, impacts vary regionally, but typically not in monotypic stands.
<a href="#"><i>Dipsacus fullonum</i></a>	common teasel	2Moderate	None	B	B	B	3.8	CW, NW, SN	Grasslands, seep, riparian scrub. Impacts regionally variable, forms dense stands on occasion.
<a href="#"><i>Festuca arundinacea</i></a>	tall fescue	2Moderate	None	B	B	A	2.9	CA-FP, CaR, CW, GV, NW, SN, SW	Coastal scrub, grasslands; common forage grass. Widespread, abiotic impacts unknown.
<a href="#"><i>Ficus carica</i></a>	edible fig	2Moderate	None	B	A	B	2.6	CW, GV, CW	Riparian woodland. Can spread rapidly. Abiotic impacts unknown. Can be locally very problematic.
<a href="#"><i>Geranium dissectum</i></a>	cutleaf geranium	2Moderate	None	C	B	A	1.6	CA-FP, CaR, CW, GV, NW, SN, SW	Numerous habitats but impacts appear minor.
<a href="#"><i>Glyceria declinata</i></a>	waxy mannagrass	2Moderate	None	B	B	B	1.9	GV	Vernal pools, moist grasslands. Often confused with native <i>Glyceria</i> . Impacts largely unknown, but may be significant in vernal pools.
<a href="#"><i>Hedera helix</i>, <i>H. canariensis</i></a>	English ivy, Algerian ivy	1High	None	A	A	A	2.6		Coastal forests, riparian areas. Species combined due to genetics questions.
<a href="#"><i>Holcus lanatus</i></a>	common velvet grass	2Moderate	None	B	B	A	2.9	CA-FP, DMoj, GB, CaR, CW, GV, NW, SN, SW, MP, SNE	Coastal grasslands, wetlands. Impacts can be more severe locally, especially in wetland areas.
<a href="#"><i>Hypochaeris radicata</i></a>	rough catsear, hairy dandelion	2Moderate	None	C	B	A	2.2	CA-FP, CaR, CW, GV, NW, SN, SW	Coastal dunes, scrub, and prairie; woodland, forest. Widespread. Impacts unknown/minor.
<a href="#"><i>Lepidium</i></a>	perennial	1High	None	A	A	A	3.0	CA-FP, GB	Coastal and inland marshes,

APPENDIX D: MCCWA WEED MANAGEMENT PLAN

<a href="#"><i>latifolium</i></a>	pepperweed, tall whitetop									riparian areas, wetlands, grasslands; potential to invade montane wetlands.
<a href="#"><i>Lolium multiflorum</i></a>	Italian ryegrass	2Moderate	None	A	B	A	2.6	CA-FP, CaR, CW, GV, NW, SN, SW		Grasslands, oak woodland, pinyon-juniper woodland; widely used for post-fire erosion control. Widespread. Impacts can vary with region.
<a href="#"><i>Ludwigia hexapetala</i></a>	Uruguay water-primrose	1High	Alert	A	B	C	2.6	CW, NW, SW		Freshwater aquatic systems. Clarification needed on taxonomic identification.
<a href="#"><i>Ludwigia peploides</i></a>	creeping water-primrose	1High	None	A	B	B	2.4	CW, GV, NW, SN, SW, DMoj		Freshwater aquatic systems. Clarification needed on taxonomic identification.
<a href="#"><i>Lythrum hyssopifolium</i></a>	hyssop loosestrife	2Moderate	None	C	B	A	3	CA-FP, CaR, CW, GV, NW, SN, SW		Grasslands, wetlands, vernal pools. Widespread. Impacts unknown, but appear to be minor.
<a href="#"><i>Mentha pulegium</i></a>	pennyroyal	2Moderate	None	C	A	A	2.6	CW, GV, NW, SW		Vernal pools, wetlands. Poisonous to livestock. Spreading rapidly. Impacts largely unknown.
<a href="#"><i>Myriophyllum aquaticum</i></a>	parrotfeather	1High	Alert	A	B	C	2.7	CaR, CW, NW, SW		Freshwater aquatic systems
<a href="#"><i>Nicotiana glauca</i></a>	tree tobacco	2Moderate	None	B	B	B	2.5	GV, NW, SN, SW, D, DMoj, DSon		Coastal scrub, grasslands, riparian woodland. Abiotic impacts unknown. Impacts vary locally. Rarely in dense stands.
<a href="#"><i>Rubus armeniacus</i> (discolor)</a>	Himalaya blackberry	1High	None	A	A	A	3	CA-FP, CaR, CW, GV, NW, SN, SW		Riparian areas, marshes, oak woodlands
<a href="#"><i>Rumex acetosella</i></a>	red sorrel, sheep sorrel	2Moderate	None	B	B	A	2.3	CA-FP, CaR, CW, GV, NW, SN, SW		Many habitats, riparian areas, forest, wetlands. Widespread. Abiotic impacts unknown. Impacts can vary locally.
<a href="#"><i>Taeniatherum caput-medusae</i></a>	medusahead	1High	None	A	A	A	3.3	CaR, GV, NW, SN, SW		Grasslands, scrub, woodland

<a href="#"><i>Torilis arvensis</i></a>	hedgearsley	2Moderate	None	C	B	B	2.3		Expanding range. Appear to have only moderate ecological impacts.
<a href="#"><i>Trifolium hirtum</i></a>	rose clover	2Moderate	None	C	B	B	2.7	CA-FP, CaR, CW, GV, NW, SN, SW	Grasslands, oak woodland. Widely planted in CA. Impacts relatively minor in most areas.
<a href="#"><i>Vulpia myuros</i></a>	rattail fescue	2Moderate	None	B	B	A	3	CA-FP, D, CaR, CW, GV, NW, SN, SW, DMoj, DSon	Coastal sage scrub, chaparral. Widespread. Rarely forms monotypic stands, but locally problematic

### Cal-IPC Inventory Categories

(Note the previous table includes only plants listed as High or Moderate; see <http://www.cal-ipc.org/ip/inventory/> for species with Limited or Evaluated but Not Listed status)

Plants receive an overall rating of High, Moderate or Limited based on evaluation using the criteria system. The meaning of these overall ratings is described below. In addition to the overall ratings, specific combinations of section scores that indicate significant potential for invading new ecosystems triggers an **Alert** designation so that land managers may watch for range expansions. Some plants were categorized as Evaluated but Not Listed because either we lack sufficient information to assign a rating or the available information indicates that the species does not have significant impacts at the present time.

**High** – These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.

**Moderate** – These species have substantial and apparent—but generally not severe—ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.

### Geographic Region Codes:

Regions invaded based on Jepson geographic regions. Click on the region code to search for weeds by region.

<CA-FP>	California Floristic Province	<D>	Desert Province	<GV>	Great Valley	<GB>	Great Basin Province
<CaR>	Cascade Range	<DMoj>	Mojave Desert	<NW>	Northwest	<MP>	Modoc Plateau
<CW>	Central West	<DSon>	Sonoran Desert	<SW>	Southwest	<SNE>	Sierra Nevada East
<SN>	Sierra Nevada						

#### Column heading abbreviations:

Imp. = Impact  
 Inv. = Invasiveness  
 Dis = Distribution  
 Doc. = Documentation Level  
 (documentation level averaged)

#### Scores:

A = Severe  
 B = Moderate  
 C = Limited  
 D = None  
 U = Unknown

#### Nomenclature:

Scientific names are based on The Jepson Manual. For each species, the first common name is based on the Weed Science Society of America's "Composite List of Weeds", followed by other names used in California.

#### Citation:

Cal-IPC. 2006. California Invasive Plant Inventory. Cal-IPC Publication 2006-02. California Invasive Plant Council: Berkeley, CA. Available: [www.cal-ipc.org](http://www.cal-ipc.org).